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The Architecture of the Not-quite-well Tempered Environment

On the Making of the New Houses of Parliament

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Introduction

Abstract: The project for the new Houses of Parliament in London was commissioned at the beginning of the 19th century, when the boom in science allowed new technologies and associated social groups to be involved in many established industries, forcing a paradigm shift in the construction industry. The mechanical engineer as a new professional field had just emerged from various backgrounds and started to define its position in architectural collaborations. This change in turn created a type of cooperative social network that was different from the tradition where the project was predominantly run by architects. The reaction, collaboration, conflict and compromise these groups made during construction stages affected the final result to a great extent. Previous research has addressed the problem of communication between these two parties [1], but focused more on the personalities of the individuals (the architect Sir Charles Barry and the mechanical engineer Dr. Reid (Fig.1)) rather than on the organizational level. This research will firstly try to depict the new Houses of Parliament construction process as it happened in the 1830s, in order to address the organizational issues involved and their possible implication for the modern architectural collaboration. Secondly, it will apply the SCOT (Social Construction of Technology) approach in setting up a controllable boundary to thoroughly study all the relevant social groups in order to explain their intertwined relationship in the construction industry in the Victorian era. The findings give a new angle to analyse innovative technology and new social groups in construction projects, indicating that similar to today's architecture industry, problems occur not only when the social groups conflict with each other, but also when this conflict has been dealt with inappropriately.

The building of the new Houses of Parliament of the UK spanned over a decade during the early years of the 19th century. The public attention along with later criticism of its built environment has added to its historical importance [2] [3]. According to many historians, the vigorous disagreements over heating and ventilation between two prominent men (the architect and the mechanical engineer) had strongly shaped the unfortunate outcome of the whole project [4] [5]. After the devastating fire of 1834 that destroyed most of the old Houses of Parliament, a design competition was launched to build a new Parliament. The winner, architect Sir Charles Barry was soon announced. Meanwhile, one of the first mechanical engineers, Dr. David Reid was commissioned by the House of Lords to take charge of the heating and ventilation design for the new building. Known for his ingenious work on many other built environment projects [6], he was given the authority to oversee the whole project with the architect's full assistance [7]. This unusual arrangement resulted in major conflicts between the architect and the engineer. As the project progressed, the superior authority of Dr. Reid

was gradually diminished and he was ultimately dismissed altogether and criticized at the end. The fact that the problems caused by lack of communication between commissioners, architects and engineers have never ceased to exist, even today, suggests the importance of re-examining this Victorian project. It is a project that could have featured the first smart HVAC (Heating, Ventilation and Air Conditioning) system ever to exist, and a project that could have helped shifting the ‘narrow-eyed aesthetic vision’ to built environment comfort as Banham advocated [8].



Fig. 1. Architect Sir Charles Barry (left) [9] and Engineer Dr. David Boswell Reid (right)

Methodology

In order to reconstruct this historical event to understand the underlying social factors that affected this innovative project, the research adopted the viewpoint of social constructivism in science and technology studies (STS). This approach distinguishes itself from technological determinism, which considers the development of science and technology as a linear process. Social constructivism emphasizes the interaction between different social groups in a technological system, and believes this social interaction largely shapes the outcomes of technological development. Social construction of technology (SCOT) is one of the most established approaches in science and technology studies, introduced by W. Bijker and T. Pinch [10]. In SCOT, ‘the developmental process of a technological artefact is described as an alternation of variation and selection’, which results in a ‘multi-dimensional’ model as opposed to a linear model. Construction projects in many ways fit into the concept of an ‘artefact’ described in STS. The SCOT method sees the construction process of ‘artefact’ (technological innovation) as a result of interaction between ‘relevant social groups’, in which all members of a certain social group share the same set of meanings (Fig.2). These different sets of meanings are the so-called ‘interpretive flexibility’, and are the reason ‘conflicts’ and ‘problems’ occur between social groups. To solve the problems, all groups have to coordinate or compromise with each other during the design/construction process of the ‘artefact’ till they reach a ‘closure’, which marks the completion (though it may be temporary) stage of such ‘artefact’ [11].

By seeing the new Houses of Parliament as an ‘artefact’, which embodies an innovative heating and ventilation system, and involves many relevant ‘social groups’ with different ‘interpretative flexibility’, the analysis of this historical construction case has benefited greatly from the use of SCOT. The following sections will examine the reason behind the failure of this grand project closely, using SCOT.

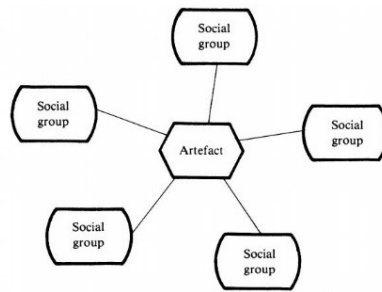


Fig. 2. The relationship between an artefact and relevant social groups [12]

Brief timeline of the construction

As the whole construction process involved conflicts of interest between multiple parties, the reconstruction of the timeline and events is based exclusively on official parliamentary reports, which documented exactly how the events happened and how investigation committees dealt with them.

1. 1835: After examining several competent professionals on the matter of warming and ventilation, Dr. Reid was commissioned to ventilate the new Houses of Parliament [13]. Dr. Reid had already successfully equipped the temporary House of Commons with his integrated warming and ventilation system earlier that year.
2. 1836: Architect Sir Charles Barry won the competition to design the new Houses of Parliament [14].
3. 1840: Construction began.
4. 1841: A letter from the Boards of Work to Architect Sir Barry stated the authority of Dr. Reid and required Barry's full assistance [15].
5. 1841: A proposal was made jointly by Reid and Barry to add a central tower for ventilation with an additional expense of £20,000 and a sum for ventilation, warming and fire proofing of £86,000 [16].
6. 1842: Investigation committee was appointed to examine the proposal for the new central tower, the committee approved the proposal at last but expressed concerns about the increased cost, Reid's authority was for the first time questioned, it was stated that no more expense should be incurred [17].
7. 1844: Other alterations had taken place and consequently delayed the project. Progress report from Barry stated the majority of the Houses of Parliament could be completed by 1846, but the ventilation system could not be fitted until 1847 [18].

8. 1844: Major investigation was made into the alterations of Houses of Parliament, it was reported the alterations were made by Barry. Reid as a witness had testified to the poor communication between him and the architect which led to insufficient information for ventilation design. Barry was not blamed for this at the end [19].
9. 1845: No record, according to later report, the construction was suspended for 9 months before Feb.1846 [20].
10. 1846: Major investigation was called into the delay of the construction, mainly against the architect and engineer, during which they delivered conflicting evidence and explanations. The investigation ultimately dismissed Reid's full authority and ordered Barry and Reid to be in charge of two separate parts of the building respectively [21].
11. 1847: The majority of the Lords' chamber was completed.
12. 1852: The Commons' chamber was completed. Barry was knighted, Reid was dismissed from the Houses of Parliament project.
13. 1870: The new Houses of Parliament completed.

Analysing the construction of new Houses of Parliament using SCOT

Identifying social groups

Government group – The Government group was the commissioner of the project, there were several committees involved (e.g. Royal Commission (to award prizes), a Committee of the House of Lords (they commissioned the style of the building to be 'Gothic or Elizabethan'), a controlling commission, Boards of Treasury and boards of works, but they were not acting against each other or inconsistently with each other, thus can be seen as one social group. For this group the new Houses of Parliament was an essential development and an urgent replacement of the destroyed old Palace of Westminster.

Architect - Sir Charles Barry. The majority of the conflicts happened between the architect and mechanical engineer. Sir Charles Barry stood on one side of the argument, blaming Dr. Reid for costly alterations and delay.

Mechanical engineer - Dr. Reid stood on the other side, was challenged by the architect, and struggled to deliver his ventilation design.

Construction supporting group – This group included several contractors and consultants: Seward (Budget estimation), James Walker (civil engineer), Grissell and Peto (mason), Faraday, Goldsworthy Gurney (mechanical engineer), Percy (successor to Reid).

Investigation group – There were several investigations which took place during the construction process, the committees included: committee of enquiry (began in 1844), committee to investigate alterations (1844), committee to superintend the completion of the new Palace (and to confirm all additional costs to Treasury). The Investigation group also included individuals: professional arbitrator Joseph Gwilt (also an architect), three other referees in 1846, and Goldsworthy Gurney (ventilator).

Users – This group includes the future occupants of the Houses of Parliament, who were the Members of the House of Lords and House of Commons. It is also the group from which the majority of complaints and criticisms of the project came.

The interpretative flexibility of the social groups

For the **Government group** (commissioner), the old parliament that had been destroyed during the fire was in great need of a replacement. Timing was of the essence. The architect Barry, having won the competition, regarded this project as the peak of his professional career[22], and a fully controlled and smooth process till its completion was crucial. Dr. Reid, after a few successes in heating and ventilation in early projects, was in the hope of experimenting and pioneering the new heating and ventilation system in this grand building, which included the spray water air filtering system, a combined heating and ventilation system (Fig.3) that had already been installed and highly evaluated in the temporary House of Commons. Meanwhile, the built environment was also the primary concern of the **Users group** (part of this group overlapped with the Government group, which will be explained later). As for the various investigation committees, who were commissioned after several conflicts and delays during the construction, they stood on a seemingly neutral ground, to ensure the project kept moving forward, however this group involved arbitrators/witnesses from other social groups (namely Construction supporting group, **Government group** and etc.).

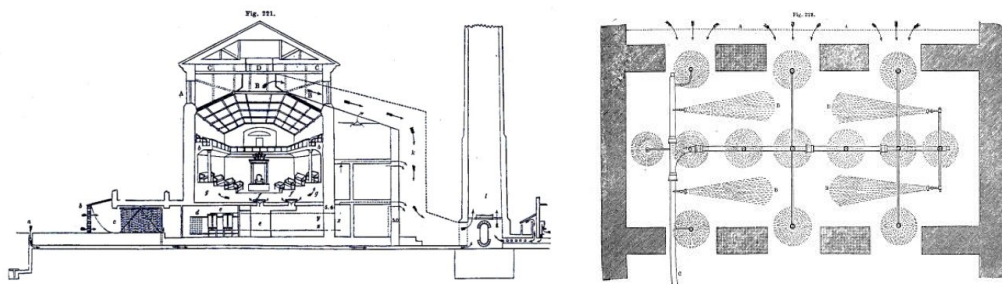


Fig. 3. Section of heating and ventilation (left) and system of air filtering using sprays of water designed by Reid and adopted in temporary House of Commons [23]

A social construction

Throughout the whole decade, Reid's ultimate authority had been gradually reduced to nothing. From the report in 1835 when Reid was appointed as engineer, it read:

...it being the decided opinion of Your Committee, that whatever Plan shall be hereafter selected, provision should be made for its adoption in the first instance by the architect, so as not only to insure its success, but to prevent needless expense and inconvenience....[24]

This evidence of Reid's declining authority had been proved again by the letter from the head of Boards of Works (**Government group**) to Barry:

I am to desire that Dr. Reid may receive from you, from time to time, as the architect of the buildings, such assistance as he may require in regard to the plans which have been prepared under your inspection for his use; and that generally, in order to second as much as possible the object which have induced the government to select Dr. Reid for the superintendence of this important service, you will in all matters of detail connected with the structure and arrangement of the new buildings afford him every requisite facility and assistance in carrying it into effect [25].

In 1842, despite being an expensive addition to the building, the construction of the new central tower was agreed to be carried out, as was the rest of Reid's plan:

...Your committee are not disposed to recommend a construction of the flues exclusively with a view to that object (ventilation); on the other hand, they should regret that any measures were taken which should absolutely preclude the adoption of Dr. Reid's recommendation, should it ultimately prove desirable [26].

However, after a major delay in 1845, Reid was no longer considered trustworthy and was blamed exclusively for the delay of the project. This position evolved in several stages. Firstly, the architect questioned whether his design was compatible with fire regulations. Whether this was an honest accusation was unclear, but this led an arbitrator, an engineer from the **Construction supporting group** to get involved in the **Investigation group**, and he then confirmed Barry's accusation. This incident delayed the project by months and consequently led to a bigger investigation which started in February 1846. Secondly, the investigation started by examining both sides of the evidence in accordance with the arbitrator (**Investigation group**) and Board of works (**Government group**) where some suggestions had been made (including having an intermediary between architect and engineer) but it was still suggested by the **Government group** that Reid should carry out his system. Thirdly, the **Government group** was further directed by several other investigations and referees, especially the architect's suggestion of carrying out the plan himself, and Reid's role as the head of mechanical engineering was terminated. The committee decided to separate the architect and the mechanical engineer to control two different parts of the building. Barry to build and ventilate the House of Lords, Reid to build and ventilate the House of Commons (Fig.4). The two parts were physically separated with a screen.

After this, the ambitions of both architect and engineer were circumscribed, as the ventilation of House of Lords was completely out of Reid's control, and the design decisions for the House of Commons were modified by Reid (see lowered ceiling revised from Barry's original drawing [27]). Worse still, the system was a failure. Neither the House of Lords nor the House of Commons were satisfied. And both systems were criticized and rendered differently by both sides of the argument [28] [29]. The 'closure' or solution was a seemingly compromised decision. Reid had control over one part of the building, while Gurney, another engineer skilled in ventilation should have been able to assist Barry in ventilating the other part. But why did it still create many

problems? Despite all the doubt and criticism of their ‘incompetency’, and the possible technical problems, the following section will examine why and how this ‘closure’ was reached and how the social construction of such ‘closure’ might have played a much more important role than previously understood.

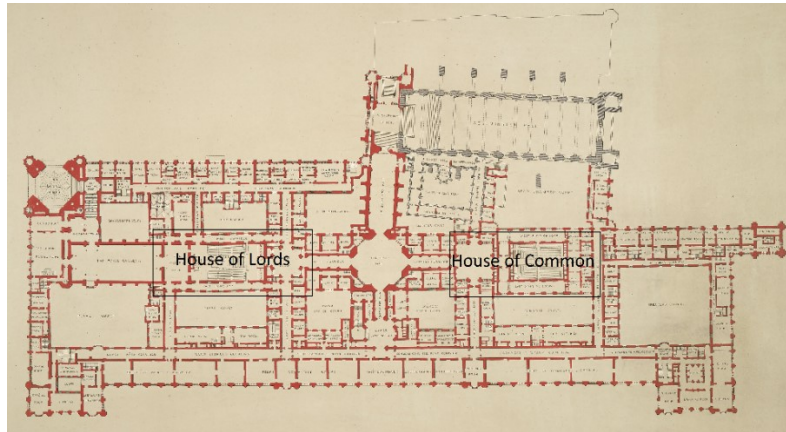


Fig. 4. Plan of new Houses of Parliament [30]

How a ‘closure’ was reached

The seemingly feasible ‘closure’ was reached among the social groups after several investigations and hearings throughout 1845 and early 1846. But before this ‘closure’ was made, there had been some conflicts within the **Government group**, between House of Lords and House of Commons. Although Reid had done a successful job in the temporary House of Commons, a split occurred within the Government group, where the House of Commons transformed itself into the **Users group**. Despite all the delay, expense and alterations Reid had been causing or accused of causing, the House of Commons decided to keep him as mechanical engineer, while the House of Lords, on the other hand, employed Barry and another ventilator who had more interpretative flexibility to design the heating and ventilation of the House of Lords. The two parts of the building were physically separated with a screen to prevent interference. Another reason this seemingly bizarre separation had been agreed can be traced in the report of 1846 where an investigation committee was called upon to hear both sides of the argument and an arbitrator’s (Joseph Gwilt) testimony. The committee questioned all three parties at one point and questioned if Reid could work harmoniously with any other architect. The investigation also examined whether the fire proofing could be resolved while keeping Reid’s system. The Board of Works suggested that Reid’s plan should be carried out and a third person should act as intermediary between Barry and Reid. However, the decision reached at the end of the investigation was hugely based on another important fact; that Reid’s system would not work technically for a long time, until the towers were built, while the House of Lords was in immediate need of completion for the next year’s opening of Parliament.

The second report from the committee showed a development in the situation when Gurney, another experienced ventilator, was called in and questioned a great deal of Reid’s system. He then provided the committee with another plan. Meanwhile, three other referees were appointed to examine Reid’s system, and made suggestions to simplify the system and ventilate the buildings with separate parts. The third report saw Reid taking the blame

for the delay, and the committee agreed on Barry taking over warming and ventilation, even though he did not have a plan at the time (!) [31], they hoped that he could deliver the completed project on time. In the end, Barry installed in the House of Lords a system very much like Reid's original plan [32].

These three events suggested three very important factors that facilitated the committee to come up with a plan to deal with the problem. To sum up, a) Reid and Reid's system were replaceable, b) If a) was true, the project could be delivered on time. c) Even if a) was not true, the project could still be delivered on time by separating the building and thus responsibilities into two parts. These three events occurred or were proposed by the **Investigation group** and the Architect, and the fact that Gurney then was involved in this project later as Reid's successor put him into the **Construction supporting group** where his neutrality was in question. This was how a seemingly perfect 'closure' was made.

Conclusion

In the evidence presented above, the paper has reconstructed the event from a different angle and presented several issues that were inaccurate or neglected in previous research.

Firstly, there was no ambiguity as to who had the authority for the project at the beginning, as Brueggemann suggested [33]. It was Reid who was invited to take charge of the project (in 1835), long before Barry, and was given the authority and Barry's support. This authority was not taken away instantly by one event (as might appeared to have happened in 1846), but as a result of a series of continuous events starting from 1841.

Secondly, there were more reasons than simply strong individual personalities involved in the failure of the project. Instead, it was caused more at an organizational level with a variety of social groups. We have identified one main reason to be the unstable social groups. Throughout the whole, we experienced several shifts in the personalities and roles of the social groups. Firstly, the Board of works changed its role from **Government group** to **Construction supporting group**, whenever an investigation committee was involved, this change questioned the authority of Reid which was partly given by the Board of works acting within its original **Government group**. Following this, another highly regarded ventilator Gurney, who was consulted in the investigation as part of **Investigation group**, moved into the **Construction supporting group** in a later stage. This to some extent made an impact on the committee to reach a decision against Reid's authority. Finally, the most dramatic change was effected by the members of the House of Commons, who shifted from the **Government group** to the **Users group** then back again, and in the end compromised with the House of Lords and reached the 'closure'.

Thirdly, the criticism, which was believed to be created by 'incompetent' people and unsatisfying technical systems, if looking at it from another angle, was also raised from a 'closure' that was supposed to end the arguments and direct the project into a success. The 'closure' that was driven by the **Construction supporting group**, **Investigation group** and the **Architect**, did not sufficiently act as a compromise between conflicting groups, rather an asymmetrical decision without the presence of the opposing groups. This action of physically separating authorities had been criticized by the committee in later report (1852).

... These difficulties and complications were further increased by the fact that, in that portion of the New Palace... there were still not less than three different and sometimes conflicting authorities, namely Architect, the Ventilator and the Board of Works... and all attempts at inquiry will be baffled by the allegation of divided responsibility. [34].

With the SCOT method, this paper has hopefully revealed that the failure of the heating and ventilation of the new Houses of Parliament was as much an organizational issue as a technical issue. The paper illustrates that the problems of the separated design between building envelope and mechanical service, the discrepancy between architects and engineers that was rooted in this Victorian case and continue to this day, need to be examined, and resolved from an organizational level.

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